

## WHAT IS CLAIMED IS:

- 1 1. A method for optimizing a supply to meet a demand comprising the steps of:  
2 determining a parts demand;  
3 determining a machine supply;  
4 maintaining a database of machine supply information, the machine supply  
5 information including, for each of a plurality of machine types, a number of machines of  
6 said machine type in the machine supply, a set of part types in said machine type, a  
7 corresponding monetary value for each part type, and a number of each part type in said  
8 machine type;  
9 configuring an optimal dismantling configuration of the machine supply to meet  
10 the parts demand as a function of the machine supply information.
- 1 2. The method of claim 1 further comprising determining at least a portion of the parts  
2 demand that cannot be satisfied from the machine supply.
- 1 3. The method of claim 1 wherein the determining a parts demand step further  
2 comprises determining an internal demand and an external demand.
- 1 4. The method of claim 1 further comprising determining at least a portion of the  
2 machine supply that is not economically justified for dismantling.
- 1 5. The method of claim 4 wherein the determining at least a portion of the machine  
2 supply that is not economically justified for dismantling further comprises determining  
3 whether parts profit of a particular machine type is a predetermined percentage greater  
4 than machine profit of a particular machine type.

1 6. The method of claim 5 further comprising determining parts profit by adding an  
2 average machine net investment book value to a total parts de-manufacturing expense to  
3 produce a sum, and subtracting the sum from a total valued parts with external demands  
4 average fair market value.

1 7. The method of claim 5 further comprising determining machine profit by adding the  
2 average net investment book value of the particular machine type to a total  
3 re-manufacturing expense for the particular machine type to produce a sum, and  
4 subtracting the sum from an average fair market value for the particular machine type.

1 8. The method of claim 4 wherein the determining at least a portion of the machine  
2 supply that is not economically justified for dismantling further comprises determining  
3 whether parts profit of a particular machine is greater than machine profit of the particular  
4 machine.

1 9. The method of claim 8 wherein the parts profit is determined by adding a machine  
2 average net investment book value to a total parts de-manufacturing expense to produce a  
3 sum, and subtracting the sum from a book value, the book value equal to the total parts  
4 with internal demands average net investment book value with a cost adjustment to the  
5 net investment book value.

1 10. The method of claim 8 wherein the machine profit is determined by adding the  
2 particular machine type average net investment book value to a total machine  
3 re-manufacturing expense to produce a sum, and subtracting the sum from an average fair  
4 market value of the particular machine type model.

1 11. The method of claim 1 further comprising :

2 determining a corresponding parts supply from the machine supply; and,  
3 matching the corresponding parts supply to the parts demand.

1 12. The method of claim 11 wherein the determining a corresponding parts supply  
2 further comprises the steps of:  
3 determining the part types in a particular machine type;  
4 determining the number of each of the part types in a particular machine type;  
5 and,  
6 multiplying the number of each of the part types in a particular machine type by  
7 the number of machines for the particular machine type in the machine supply.

1 13. The method of claim 11 further comprising:  
2 generating a covered parts list and a not-covered parts list if the part supply is  
3 less than the parts demand; and,  
4 wherein the configuring step comprises:  
5 determining the optimal dismantling configuration of the machines in the  
6 covered parts list; and,  
7 determining the optimal dismantling configuration of machines to harvest  
8 from the not-covered list.

1 14. The method of claim 13 wherein the covered parts list is divided into an internal and  
2 an external list.

1 15. The method of claim 1 wherein the optimal dismantling configuration is determined  
2 by linear programming.

1 16. The method of claim 1 wherein the optimal dismantling configuration is determined

2 by maximizing a summation formula for revenue considering a number of factors for a  
3 part j and a machine i.

1 17. The method of claim 16 wherein the factors are:  
2 revenue from parts j sales ( $RV_j$ );  
3 net investment cost of machine ( $TC_i$ );  
4 processing cost of de-manufacturing machine i ( $PC_i$ );  
5 total supply of machine i ( $S_i$ );  
6 netted demand of part j ( $D_j$ );  
7 parts not utilized ( $W_{ij}$ );  
8 parts fulfillment ( $X_{ij}$ );  
9 machines required to fulfill the desired parts ( $Y_i$ ).

1 18. The method of claim 17 wherein the summation formula is:

$$\sum_i \sum_j (RV_j \cdot \{X_{ij}\}) - \sum_i (TC_i \cdot \{Y_i\}) - \sum_i (PC_i \cdot \{Y_i\})$$

1 19. The method of claim 1 wherein the machine supply information further comprises  
2 the number of parts for each of the part types in each of the machine types.

1 20. The method of claim 1 wherein the machine supply information further comprises a  
2 forecast of machines expected to be available at a predetermined time.

1 21. The method of claim 1 wherein the machine supply information further comprises an  
2 estimated number of parts for each of the part types in each of the machine types.

1 22. The method of claim 1 wherein the machine supply information further comprises

- 2 fair market value of the part types and fair market value of the machine types.
- 1 23. The method of claim 1 wherein the machine supply information further comprises  
2 costs of de-manufacturing a specific machine type.
- 1 24. The method of claim 1 wherein the machine supply information further comprises  
2 data on the quality of parts yielded from de-manufacturing a specific machine type.
- 1 25. The method of claim 1 wherein the machine supply information further comprises  
2 codes for options on each of the machine types.
- 1 26. The method of claim 1 wherein the machine supply information further comprises  
2 quality of each of the machine types.
- 1 27. The method of claim 1 wherein the machine supply information further comprises  
2 times for demanufacturing cycles of a particular machine type.
- 1 28. The method of claim 1 wherein the machine supply information further comprises  
2 times for refurbishing cycles of a particular machine type.
- 1 29. The method of claim 1 wherein the machine supply information further comprises  
2 repair costs for each of the part types.
- 1 30. An economic supply optimization system comprising:  
2 a processor;  
3 a data storage device operably connected to the processor, the data storage device  
4 providing data storage for the system;

5 a database of machine supply information on the data storage device, the machine  
6 supply information including, for each of a plurality of machine types, a number of  
7 machines of said machine type in the machine supply, a set of part types in said machine  
8 type, a corresponding monetary value for each part type, and a number of each part type  
9 in said machine type;

10 a program executable by the processor to  
11 determine a parts demand;  
12 determine a machine supply; and,  
13 configure an optimal dismantling configuration of the machine supply to  
14 meet the parts demand as a function of the machine supply information.

1 31. The system of claim 30 wherein the program is further executable to determine at  
2 least a portion of the parts demand that cannot be satisfied from the machine supply.

1 32. The system of claim 30 wherein the program is further executable to determine at  
2 least a portion of the machine supply that is not economically justified for dismantling.

1 33. The system of claim 32 wherein the economic justification further comprises parts  
2 profit of a particular machine type being a predetermined percentage greater than machine  
3 profit of a particular machine type.

1 34. The system of claim 33 wherein the parts profit is determined by adding an average  
2 machine net investment book value to a total parts de-manufacturing expense to produce  
3 a sum, and subtracting the sum from a total valued parts with external demands average  
4 fair market value.

1 35. The system of claim 33 wherein the machine profit is determined by adding the

2 average net investment book value of the particular machine type to the total  
3 re-manufacturing expense for the particular machine type to produce a sum, and  
4 subtracting the sum from an average fair market value for the particular machine type.

1 36. The system of claim 32 wherein the economic justification further comprises parts  
2 profit of a particular machine being greater than machine profit of the particular machine.

1 37. The system of claim 36 herein the parts profit is determined by adding a machine  
2 average net investment book value to a total parts de-manufacturing expense to produce a  
3 sum, and subtracting the sum from a book value, the book value equal to a total parts with  
4 internal demands average net investment book value with a cost adjustment to the net  
5 investment book value.

1 38. The system of claim 36 wherein the machine profit is determined by adding the  
2 particular machine type average net investment book value to a total machine  
3 re-manufacturing expense to produce a sum, and subtracting the sum from an average fair  
4 market value of the particular machine type model.

1 39. The system of claim 30 wherein the program is further executable to:  
2 determine a corresponding parts supply from the machine supply; and,  
3 to match the corresponding part supply to the parts demand.

1 40. The system of claim 39 wherein the program is further executable to determine the  
2 corresponding parts supply by:  
3 determining the part types in a particular machine type;  
4 determining the number of each of the part types in a particular machine type;  
5 and,

6 multiplying the number of each of the part types in a particular machine type by  
7 the number of machines for the particular machine type in the machine supply.

1 41. The system of claim 39 wherein the program is further executable to:  
2 generate a covered parts list and a not-covered parts list if the parts supply is less than the  
3 parts demand, and to configure the optimal dismantling configuration by:

4 determining the optimal dismantling configuration of the machines in the covered  
5 parts list; and,

6 determining the optimal dismantling configuration of machines to harvest  
7 from the not-covered list.

1 42. The system of claim 41 wherein the covered parts list is divided into an internal and  
2 an external list.

1 43. The system of claim 30 wherein the optimal dismantling configuration is determined  
2 by linear programming.

1 44. The system of claim 30 wherein the optimal dismantling configuration is determined  
2 by maximizing a summation formula for revenue considering a number of factors for a  
3 part j and a machine i.

1 45. The system of claim 44 wherein the factors are:  
2 revenue from parts j sales ( $RV_j$ );  
3 net investment cost of machine ( $TC_i$ );  
4 processing cost of de-manufacturing machine i ( $PC_i$ );  
5 total supply of machine i ( $S_i$ );  
6 netted demand of part j ( $D_j$ );



- 7 parts not utilized ( $W_0$ );  
 8 parts fulfillment ( $X_0$ );  
 9 machines required to fulfill the desired parts ( $Y$ ).

- 1 46. The system of claim 45 wherein the summation formula is:

$$\sum_i \sum_j (RV_j \cdot \{X_{ij}\}) - \sum_i (TC_i \cdot \{Y_i\}) - \sum_i (PC_i \cdot \{Y_i\})$$

- 1 47. The system of claim 30 wherein the machine supply information further comprises  
 2 the number of parts for each of the part types in each of the machine types.

- 1 48. The system of claim 30 wherein the machine supply information further comprises a  
 2 forecast of machines expected to be available at a predetermined time.

- 1 49. The system of claim 30 wherein the machine supply information further comprises  
 2 an estimated number of parts for each of the part types in each of the machine types.

- 1 50. The system of claim 30 wherein the machine supply information further comprises  
 2 fair market value of the parts and fair market value of each of the machine types.

- 1 51. The system of claim 30 wherein the machine supply information further comprises  
 2 costs of de-manufacturing a specific machine type.

- 1 52. The system of claim 30 wherein the machine supply information further comprises  
 2 data on the quality of parts yielded from de-manufacturing a specific machine type.

- 1 53. The system of claim 30 wherein the machine supply information further comprises

2 codes for options on each of the machine types.

1 54. The system of claim 30 wherein the machine supply information further comprises  
2 quality of each of the machine types.

1 55. The system of claim 30 wherein the machine supply information further comprises  
2 times for demanufacturing cycles of a particular machine type.

1 56. The method of claim 1 wherein the machine supply information further comprises  
2 times for refurbishing cycles of a particular machine type.

1 57. The system of claim 30 wherein the machine supply information further comprises  
2 cost repairs for each of the part types.

1 58. Computer executable process steps operative to control a computer, stored on a  
2 computer readable medium, for determining an optimal dismantling configuration  
3 comprising the steps of:  
4 determine a parts demand;  
5 determine a machine supply;  
6 configure the optimal dismantling configuration to meet the demand with a  
7 particular number and a particular type of machine from the machine supply.

1 59. The computer executable process steps of claim 58 further comprising:  
2 maintaining a database of machine supply information, the machine supply  
3 information including, for each of a plurality of machine types, a number of machines of  
4 said machine type in the machine supply, a set of part types in said machine type, a  
5 corresponding monetary value for each part type, and a number of each part type in said

- 6 machine type;  
7 configuring an optimal dismantling configuration of the machine supply to meet  
8 the parts demand as a function of the machine supply information.
- 1 60. The computer executable process steps of claim 58 further comprising a step to  
2 determine at least a portion of the parts demand that cannot be satisfied from the machine  
3 supply.
- 1 61. The computer executable process steps of claim 58 further comprising a step to  
2 determine at least a portion of the machine supply that is not economically justified for  
3 dismantling.
- 1 62. The computer executable process steps of claim 61 wherein the economic  
2 justification further comprises parts profit of a particular machine type being a  
3 predetermined percentage greater than machine profit of a particular machine type.
- 1 63. The computer executable process steps of claim 62 wherein the parts profit is  
2 determined by adding an average machine net investment book value to a total parts  
3 de-manufacturing expense to produce a sum, and subtracting the sum from a total valued  
4 parts with external demands average fair market value.
- 1 64. The computer executable process steps of claim 62 wherein the machine profit is  
2 determined by adding the average net investment book value of the particular machine  
3 type to the total re-manufacturing expense for the particular machine type to produce a  
4 sum, and subtracting the sum from an average fair market value for the particular  
5 machine type.

1 65. The computer executable process steps of claim 61 wherein the economic  
 2 justification further comprises parts profit of a particular machine being greater than  
 3 machine profit of the particular machine.

1 66. The computer executable process steps of claim 65 herein the parts profit is  
 2 determined by adding a machine average net investment book value to a total parts  
 3 de-manufacturing expense to produce a sum, and subtracting the sum from a book value,  
 4 the book value equal to a total parts with internal demands average net investment book  
 5 value with a cost adjustment to the net investment book value.

1 67. The computer executable process steps of claim 65 wherein the machine profit is  
 2 determined by adding the particular machine type average net investment book value to a  
 3 total machine re-manufacturing expense to produce a sum, and subtracting the sum from  
 4 an average fair market value of the particular machine type model.

1 68. The computer executable process steps of claim 58 further comprising steps to:  
 2 determine a corresponding parts supply from the machine supply; and,  
 3 to match the corresponding part supply to the parts demand.

1 69. The computer executable process steps of claim 68 further comprising the step to  
 2 determine the corresponding parts supply by:  
 3 determining the part types in a particular machine type;  
 4 determining the number of each of the part types in a particular machine type;  
 5 and,  
 6 multiplying the number of each of the part types in a particular machine type by  
 7 the number of machines for the particular machine type in the machine supply.

1      70. The computer executable process steps of claim 69 further comprising the steps to:  
 2              generate a covered parts list and a not-covered parts list if the parts supply is less  
 3      than the parts demand, and to configure the optimal dismantling configuration by:  
 4              determining the optimal dismantling configuration of the machines in the  
 5              covered parts list; and,  
 6              determining the optimal dismantling configuration of machines to harvest  
 7              from the not-covered list.

1      71. The computer executable process steps of claim 70 wherein the covered parts list is  
 2      divided into an internal and an external list.

1      72. The computer executable process steps of claim 58 wherein the optimal dismantling  
 2      configuration is determined by linear programming.

1      73. The computer executable process steps of claim 58 wherein the optimal dismantling  
 2      configuration is determined by maximizing a summation formula for revenue considering  
 a number of factors for a part j and a machine i.

1      74. The computer executable process steps of claim 73 wherein the factors are:  
 2              revenue from parts j sales ( $RV_j$ );  
 3              net investment cost of machine ( $TC_i$ );  
 4              processing cost of de-manufacturing machine i ( $PC_i$ );  
 5              total supply of machine i ( $S_i$ );  
 6              netted demand of part j ( $D_j$ );  
 7              parts not utilized ( $W_{ij}$ );  
 8              parts fulfillment ( $X_{ij}$ );  
 9              machines required to fulfill the desired parts ( $Y_i$ ).

- 1 75. The computer executable process steps of claim 74 wherein the summation formula  
2 is:

$$\sum_i \sum_j (RV_j \bullet \{X_{ij}\}) - \sum_i (TC_i \bullet \{Y_i\}) - \sum_i (PC_i \bullet \{Y_i\})$$

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- 1 76. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises the number of parts for each of the part types in each of the  
3 machine types.

- 1 77. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises a forecast of machines expected to be available at a  
3 predetermined time.

- 1 78. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises an estimated number of parts for each of the part types in  
3 each of the machine types.

- 1 79. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises fair market value of the part types and fair market value of  
3 the machine types.

- 1 80. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises costs of de-manufacturing a specific machine type.

- 1 81. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises data on the quality of parts yielded from de-manufacturing

3 a specific machine type.

1 82. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises codes for options on each of the machine types.

1 83. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises quality of each of the machine types.

1 84. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises times for demanufacturing cycles of a particular machine  
3 type.

1 85. The method of claim 1 wherein the machine supply information further comprises  
2 times for refurbishing cycles of a particular machine type.

1 86. The computer executable process steps of claim 58 wherein the machine supply  
2 information further comprises cost repairs for each of the part types.